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(54) Title of the Invention: Method for Producing Transfer Paper Used in Porcelain

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Detailed Description of the Invention

This invention relates to a method for producing transfer paper used in porcelain that can easily be removed (peeling off) during image transfer and permits the production of good design surface.

Conventionally, two kinds of transfer paper are known for porcelain products: composite paper and slide paper. Slide paper is more convenient for its better operation efficiency, it can easily be finished and, therefore, it has widely been used in recent times. Such slide paper is formed by applying a water-soluble pasting substance on a water-absorbing supporting paper and forming then a printing layer and a water-resistant film layer thereon. In this case, the up-down relationship of the printing layer and the water-resistant layer can be selected at desire. As for the water-soluble pasting substance used in this slide paper, starch, dextrin, carboxymethylcellulose, methylcellulose, polyvinylalcohol and the like were used in the Prior Art.

Considering starch from among them, its remoisturing solubility is poor when moistened in water and it requires a long time to separate from the supporting paper. Consequently, the operation efficiency is not good when a slide paper made of starch is used in the treatment of porcelain products.

As far as dextrin is concerned, it is good both from the point of view of remoisturing solubility and separability but, during its use, „shrinkage" of the image pattern may occur at baking of the porcelain product and the fine design may deteriorate during finishing. As for carboxymethylcellulose, its ash content is high and its application is undesirable because the pattern can be deformed after baking. In contrast with the above, in the case of using water-soluble non-ionic cellulose derivatives such as methyl cellulose, hydroxypropylmethylcellulose, hydroxyethylcellulose, hydroxyethylmethylcellulose, and other cellulose ethers, finishing can be performed extremely well but, here too, the remoisturing solubility remains a drawback and, therefore, a wide application could not be expected.

This invention relates to a method for producing transfer paper used in porcelain in order to avoid the above-described inconveniences of the Prior Art and it is characterised in that a water-soluble pasting substance consisting of water-soluble non-ionic cellulose derivative and one or more monosaccharides or oligosaccharides is applied on a supporting paper and

a printing layer and a water-resistant film layer are formed thereon.

Hereinafter, the invention is explained in detail.

The authors of this invention noticed that cellulose derivatives mentioned above are fundamentally different from starch and other similar substances considering that they are *ab ovo* easily soluble in cold water. Thereafter, they discovered that, when aiming at improving the remoisturing solubility, such improvement can be attained by adding one or more monosaccharides or oligosaccharides to these cellulose derivatives and using the mixture obtained for the production of a water-soluble pasting layer. In concrete terms and as mentioned above, a water-soluble non-ionic cellulose derivative exhibits a good solubility in cold water but if such a substance is used (alone), a certain length of time is necessary for the dissolution of the film layer created on the supporting paper by the water penetrated through this supporting paper. For this reason, the substance keeps its tacky adhesion even after its dissolution what makes the sliding separation difficult. When adding, however, one or more monosaccharides or oligosaccharides to this cellulose derivative, as proposed in this invention, there is no more distortion on the pattern after baking, the water-solubility of the pasting layer is enhanced and sliding separability becomes easier conjointly with a decrease in concentration of the cellulose derivative. Besides, in the Prior Art,

it was necessary to apply a lower coating on this water-soluble pasting layer formed on the supporting paper in order to cover (close) the pores of the said supporting paper and an upper coating as an adhesive layer. But the water soluble pasting substance according to the method of this invention can be used for either or both of the above purposes.

As for its application, the water-soluble pasting substance is preferably an aqueous solution with 10 to 40% of solid content. Monosaccharides or oligosaccharides or their combination constitute preferably 10% to 60% of this solid content. If their amount exceeds 60%, the adhesivity deteriorates and, below 10%, sliding separation becomes difficult.

Water-soluble non-ionic cellulose derivative used in the method of this invention can be methyl cellulose, hydroxypropylmethylcellulose, hydroxyethylcellulose, hydroxyethylmethylcellulose, and other cellulose ether but other cellulose derivatives can also be used provided they belong to the class of water-soluble non-ionic derivatives. These substances can be used alone or in combination.

According to the method of this invention, monosaccharide added to the said cellulose derivative can be glucose, fructose, mannose, galactose, etc. hexose compound but pentose compounds like arabinose can also be used. Further, an oligosaccharide added to this cellulose derivative can be preferably a disaccharide composed of two hexoses but tri-

saccharides, tetrasaccharides constituted of hexoses and oligosaccharides including pentoses are also applicable as well as inverted sugars and similar monosaccharide mixtures.

These monosaccharides and oligosaccharides are well soluble in water and they are fully compatible with cellulose derivatives. Therefore the solution ready for application can easily be formed, the coating substance produces a homogeneous film layer. As a result, owing to the method of this invention, the formation of uneven spots when gluing to the supporting paper and printing on the film layer can be prevented and there is no time-change such as leakage onto the supporting paper or the surface of the water-resistant film layer. The substance is neutral and exhibits low reactivity. Thus, it has no influence whatsoever on the paints (colours), which is a particular advantage of this substance.

In addition to the above-mentioned cellulose derivatives and sugars, the said water-soluble pasting substance used in the method of this invention may also include water-absorbant materials, lubricants, softening agents, plasticisers, etc. Further, concerning the manufacture of a slide paper according to the method of this invention, it is possible to put printing on the water-soluble pasting layer applied on the supporting paper or form a water-resistant film layer thereon or, optionally and as opposed to the above sequence, coat the water-soluble pasting layer with a water-resistant film layer and perform printing

on this latter. In both cases, there is no particular limitation as for this water-resistant film layer.

Hereinafter the method of this invention is explained by presenting Examples of Embodiment.

Examples

Lower coating and upper coating having the composition shown in the following Table were applied on a supporting paper to form a water-soluble pasting layer. Printing was performed thereon and, subsequently, a water-resistant film layer was coated with the composition shown in the Table. Thus, a slide paper was prepared.

Next, this paper was immersed in water and the separability was evaluated. Also, the paper was used in porcelain manufacture and the quality after baking was studied. The results are summarised in the Table.

The Table contains, for comparison, the data obtained without addition of monosaccharides or oligosaccharides.

No. of Example	Water-soluble pasting layer		Water-resistant film layer	Separability	Layout after baking
	Lower coating	Upper coating			
Example 1	20% aqueous solution of methyl cellulose	Aqueous solution of methyl cellulose 20% and saccharose 10%	30% acetone solution of acetyl cellulose	Good	No pattern deformation
Example 2	20% aqueous solution of methyl cellulose	Aqueous solution of methyl cellulose 20% and glucose 15%	30% acetone solution of acetyl cellulose	Good	No pattern deformation
Example 3	20% aqueous solution of methyl cellulose	Aqueous solution of hydroxypropyl-methyl cellulose 15% and saccharose 10%	30% acetone solution of acetyl cellulose	Good	No pattern deformation
Example 4	20% aqueous solution of methyl cellulose	Aqueous solution of methyl cellulose 20%, saccharose 10% and glucose 5%	30% acetone solution of acetyl cellulose	Good	No pattern deformation
Example 5	20% aqueous solution of methyl cellulose	Aqueous solution of hydroxyethyl cellulose 20% and saccharose 15%	30% acetone solution of acetyl cellulose	Good	No pattern deformation
Example 6	20% aqueous solution of methyl cellulose	Aqueous solution of hydroxyethyl methylcellulose 20% and saccharose 15%	30% acetone solution of acetyl cellulose	Good	No pattern deformation
Example 7	20% aqueous solution of methyl cellulose	Aqueous solution of methyl cellulose 10%, hydroxypropyl-methylcellulose 10% and saccharose 10%	30% acetone solution of acetyl cellulose	Good	No pattern deformation
Example 8	30% aqueous solution of polyvinyl alcohol	Aqueous solution of hydroxy-propyl-methyl cellulose 20%, glucose 10%, fructose 10% and propylene glycol	30% acetone solution of acetyl cellulose	Good	No pattern deformation

		5%			
Example 9	Aqueous solution of methyl-cellulose 10%, hydroxypropyl-methylcellulose 10%	Aqueous solution of methyl cellulose 20% , saccharose 10% and glycerin 5%	Ethyl acetate solution of vinyl acetate 20% and acetyl cellulose 20%	Good	No pattern deformation
Example 10	Aqueous solution of methyl cellulose 20% and saccharose 15%	Aqueous solution of hydroxy-propyl-methyl cellulose 20%, and saccharose 15%	20% acetone solution of ethyl cellulose	Good	No pattern deformation
Example 11	Aqueous solution of hydroxy-propyl-methyl cellulose 20%, and saccharose 15%	Aqueous solution of methyl cellulose 25% saccharose 15% and surfactant 2%	30% acetone solution of acetyl cellulose	Good	No pattern deformation
Comparative Example 1	20% aqueous solution of methyl cellulose	20% aqueous solution of methyl cellulose	30% acetone solution of acetyl cellulose	Poor separability	No pattern deformation
Comparative Example 2	20% aqueous solution of methyl cellulose	Aqueous solution of dextrin 20% and methyl cellulose 5%	30% acetone solution of acetyl cellulose	Good	Shrinkage of the image pattern
Comparative Example 3	20% aqueous solution of methyl cellulose	20% aqueous solution of carboxymethyl-cellulose	30% acetone solution of acetyl cellulose	Good	Deformation and Color modification of the image

Claims

A method for producing transfer paper used in porcelain characterised in that a water-soluble pasting substance consisting of water-soluble non-ionic cellulose derivative and one or more monosaccharides or oligosaccharides is applied on a supporting paper and then a printing layer and a water-resistant film layer are formed thereon.